THE MODEL ENGINEER

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Smoke Rings

Like Son, Like Father

MY readers will no doubt remember the excellent working model excavator made by Master William H. Aikman which was illustrated and described in our issue of September 11th last. The father of this young model maker, Mr. T. S. Aikman, now comes along with the story of a model engine which he himself made, when a boy in Scotland, where materials were very difficult to obtain. A picture of this good-looking model appears on our cover this week, from which it will be gathered that the lamp of model engineering burns brightly within these family walls. Mr. T. S. Aikman writes: —" I do not like to be outdone altogether by my son in this week's MODEL ENGINEER with his excavator, so I enclose herewith photograph of a two-cylinder single-acting engine which I made when I was a boy. I had not commenced my apprenticeship then in the small country village in Scotland and materials were very difficult to obtain there at that time. It was true that I had a kind of watchmaker's hand-driven lathe, but after I had designed this engine and found that castings were unprocurable, I set about making these myself. My father was (and still is) the local printer, so I borrowed some of his type-metal, made wood moulds for the cylinder and crankcase, and cast these from a ladle heated over the kitchen fire. The type-metal cast beautifully and machined easily, and in due course the engine was completed and connected up to a 'cocoa tin' boiler. The brass pistons did a few strokes, then promptly seized up. After easing the cylinder bores a few times they became so big that they passed too much steam and the engine refused to function. The type-metal was too soft for this purpose and cannot be recommended in contact with brass, but nevertheless I have since made many kinds of small castings successfully from this metal quickly, by using wood moulds only. Working parts require bushing with brass. I was rather disheartened at the time with this engine, as I had not the facilities for bushing the cylinders, so the parts lay in a box until a short time ago when I decided to use the lathe my sons were using, and I rebored the cylinders and bushed them. On reassembling the parts, the engine worked perfectly on compressed air, so I fitted an air receiver with safety-valve behind the engine and provided it with a nipple to fit a car tyre inflator or 'free air' supply at the local garage. The engine runs very smoothly at high speed, having twin-cylinders ½ in. bore with heavy balanced cranks at 180 deg. It now adorns my drawing-room mantelshelf and may be demonstrated any time just by connecting up the tyre pump. Yours since 1900, T. S. AIKMAN."

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An Advertising Experience

A READER who has made effective use of our "Sales and Wants" column writes:—" In response to a recent advertisement, I had 15 registered and 11 ordinary letters; two of the latter containing Treasury notes. All had to be returned, and after expenses of advertising and registered letters to return money, I reckon I am at a loss on the deal. No fault of yours, of course. Could you call your readers' attention to the fact that unless they include sufficient postage for the return of their cash (if they do not secure the article) they must expect it to be deducted, and also point out the danger of sending cash unregistered, as it is extremely unfair to the seller in these dangerous times. Unless I receive a stamp with any enquiries I always ignore them entirely, but when you have other people's cash on your hands it must be returned if the goods have been sold." I hope that readers who reply to offers of goods for sale will be guided by the very reasonable suggestions set out by this correspondent.

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A Model Convoy

AN interesting model of an Atlantic ship convoy is on view at the Central Library, Eastbourne, during the month of October. The models are miniatures to the scale of 100 ft. to the inch, and include many notable ships, both in the naval escort and in the convoy itself. They are the work of Mr. Bernard Hotchkiss, of Polegate.

. . . ——

The Kenview Model Railway

I AM glad to hear that this well-known model railway in Bishop's Avenue, East Finchley, is recovering from the damage it suffered from fire a year ago. In its reconstructed form electric trains will be running on an "OO" gauge track, and on the outdoor portion of the railway there is to be a model waterfall, which will form a feature of a West Highlands scena. The railway is open for public inspection on Saturday afternoons and on Sundays in aid of charities. Mr. Beach is to be congratulated on his undaunted efforts in maintaining such an attractive display.

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A South African Remembrance

A RECENT South African mail brought me two copies of the illustrated magazine, *The Outspan*, a lavishly produced record of life and interests in that Dominion. The initials "C.E.T." on the wrapper enable me to identify the sender, and to him I would express my appreciative thanks for this glimpse of the sunshine of South Africa. My only feeling of regret in turning over these elaborate and entertaining issues is that the same liberal allowance of printing paper is not available to publishers in the home country. We have to serve our menu of mental stimulus almost in tabloid form.

Percival Marshall

A Model "GRASSHOPPER" Steam Engine

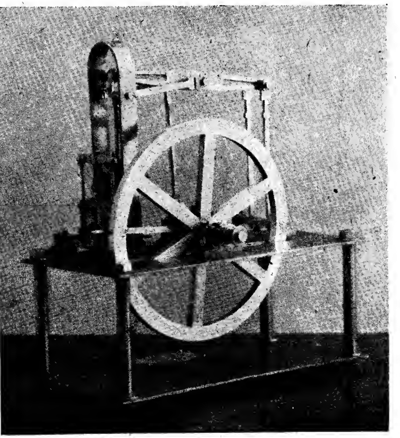
By C. Bovey

THE prototype of the engine from which the scale model was made did much useful work from 1851 to 1937, making a total of 86 years, working six days every week. In my opinion there are very few steam engines which can beat this record. This engine won 1st prize at the Hyde Park Exhibition in 1851. She was certainly working in 1937 or perhaps later, pumping water and grinding malt, but now, alas, she is rusting out.

Details of the Model—Scale 2 in. = 1 ft.

When I decided to make this model I realised I had no lathe, the only tools available being a few files, hacksaw, and a hand drilling-machine, most of which belonged to my father, who is a marine engineer. My workshop bench was the kitchen table with a small parallel vice. After a long talk with him I decided to make a start. The first part tackled was the flywheel, cut from ⅜-in. steel plate, cut with hacksaw, rim being trimmed up with a file; next, the six spokes or arms were formed by chain drilling with ⅛-in. drill and trimmed up with a file. This wheel, which was 8½ in. dia., took three weeks to make. The cylinder I could not make without a lathe, so getting in touch with a man at Southampton who advertised for lathe work, I sent him full particulars of the cylinder required, which was as follows:—

Bore, ¾ in.; depth, 1¾ in.; flange on top of cylinder, round to take a circular cover; flange on bottom of cylinder, square, the bore being carried right through, hence the upper bedplate forms the cylinder bottom, precisely as in the original engine. This is the only casting in the model and is made of brass. The upper and lower bedplates are cut from ⅜-in. planished steel plate, both measuring 12 in. × 6 in., the upper plate having a slot cut to admit flywheel; upper bedplate is fastened to bottom one with four bolts ¼ in. dia., sheathed with ½-in. brass tubing 4½ in. long, the brass tubing forming four columns between the two bedplates. The beam support was made from a piece of ⅛ in. × ¾ in. strip brass bent and inverted an elongated U-shape with feet turned at right-angles, ½-in. feet, and bolted to bedplate by two ⅛-in. bolts in each foot, standing directly over cylinder and measures 8 in. × 1½ in. span.



Mr. Bovey's 2-in. scale "Grasshopper" engine

A Double Beam

The double beam is made up of four sections of 1/16-in. brass, two of these sections were drilled and slots filed out to form panels (like the original, which had a beam of two cast iron sections) sweated together with solder. At the centre of the beams are two gudgeon pins; attached to these, with split brass bearing, are two horizontal links of square steel 3½ in. long, each having a gudgeon screwed into U support; these the rods have no brasses but work on eye-ends. The vertical lateral motion rods are made from ⅛ in. × 3/16 in. square steel 5½ in. long, passing through ¼ in. square steel shaft with journals at each end, 2½ in. apart. The crankshaft measures 4 in. overall and is ⅜ in. dia., the crank web is cut from ⅜-in. steel, the centres are ⅞ in., giving a stroke of 1¾ in. The web is held on crankshaft by a ⅛-in. set-screw. Each side of the main bearing, flywheel side, there are two thrust collars fastened to shaft with set-screws, ⅛ in. dia. The eccentric-sheave is of steel and is 1 in. dia. held on shaft with a ⅛-in. sunk set-screw. The eccentric-strap is of brass in two sections joined by (two) 3/32-in. bolts. The eccentric-rod is made from ⅛-in. sheet steel 4¼ in long, a T-end next to strap with two 3/32-in. cheese-head screws, the rocking shaft end being an eye with cone end ½ in. long. The connecting-rod is 5 in. long made from ⅜ in. × ¼ in. steel filed round and taper, and shoulder each end being square to take split brasses and shoes. The two main bearings cut from ⅜-in. sheet brass are split and drilled ⅜ in. to admit shaft; the feet are 1½ in. × ⅜ in. bolted to bedplate with two ⅛-in. bolts. The slide-valve is of the D-type and is operated by means of a rocking shaft on which are two short bell cranks worked from the eccentric-rod; to these cranks are coupled fork-end round links extending to eye-ends on gudgeons, on a crosshead through which the valve spindle passes, with an adjusting thread with nut and lock-nut similar to those used in the old side-lever marine engines. This model was exhibited at THE MODEL ENGINEER Exhibition in September, 1928, and I was awarded a Diploma of Merit for my exhibit. The time taken to make this engine was 12 months, working every evening. Many people have remarked to me how much better a job I could have made had I owned a lathe. There is little doubt the first steam engine was made without a lathe, also files were not plentiful in those days.

*The Oil Engine as a Model

Difficulties encountered in reproducing the oil engine on a small scale—and a few suggestions as to how the problem might be dealt with

By B.C.J.

THE proposal set forth in the previous pages cannot conveniently be applied to a model of a *vertical* oil engine, for a common crankpin cannot be used. Such an arrangement would, of course, bring about an incorrect relation of displacer and working piston movement. Other means must, therefore, be sought for giving motion to a sub-floor displacer. There seem to be two possibilities and one of them is illustrated in Fig. 6.

On the right-hand side of the figure is a vertical oil engine such as is—or recently was—manufactured by Messrs. Petters Ltd. the well-known makers of this class of engine. It should perhaps be pointed out before proceeding that the engine is of *two-stroke* cycle and there is, therefore, an entire absence of mechanically-operated valves. The gas flow into and out of the cylinder is brought about by piston-controlled ports only. The absence of external moving parts for valve operating and the desirability, for purposes of realism, for enclosing crank, connecting-rod and piston skirt renders this class of engine less suitable for "caloric" treatment than the previous very excellent example. The flywheel end of the crankshaft is fitted with a disc-crank, and the shaft end is supported by an A-frame standard. It is the suggestion of the writer that the crank-disc and connecting-rod should be placed out of view by means of a neat sheet-metal casing of planished steel or other suitable material. The upper part is, of course, semi-cylindrical. This casing need not be unsightly and might perhaps suggest a reduction gear for driving some slow-running machine.

As for the displacer and its container, little need be said, for these details are not dissimilar from those shown in Fig. 3. The cooling water tank, by the way, is intended to extend from back to front of the box-form base, so that its capacity may permit runs of long duration without bringing the water to boiling point.

Attention should be drawn to the fact that the exhaust pipe of the Petter engine would normally be flanged to the cylinder about halfway between the top and bottom joints. But this position would not suit the arrangement being described. The "transfer" pipe must leave the cylinder near its upper end, so that the port may make communication with the upper end of the cylinder bore. Note that the exhaust pipe or transfer pipe—which you will—is carried *through* a dummy silencer, which may take the form of the usual cast-iron box.

Fig. 7 shows yet another method of dealing with the vertical engine. In this case a supplementary horizontal crankshaft with its connecting-rod is chain-driven from an extension of the engine crankshaft—the chain being concealed in a suitable casing. When fitting the chain it must be borne in mind that the main crankpin must have the correct relation to the displacer crankpin. For example, with the arrangement shown in Fig. 7, both crankpins should be in their *highest* position.

As in the previous case, the "transfer" pipe passes through a dummy silencer, and as for the remaining details these may be much the same as those indicated in Figs. 3 and 6. It will be noticed, by the way, that the silencer is open at the bottom and that it effectively conceals the transfer pipe union. Thus the silencer may be slid up the pipe for access to the union. One wonders whether models such as described, and particularly the one outlined in Fig. 3, would not constitute an attractive feature if placed in the entrance hall or waiting room of the works of some well-known maker of Diesel oil engines. The model could be kept in motion throughout the working day and would perhaps

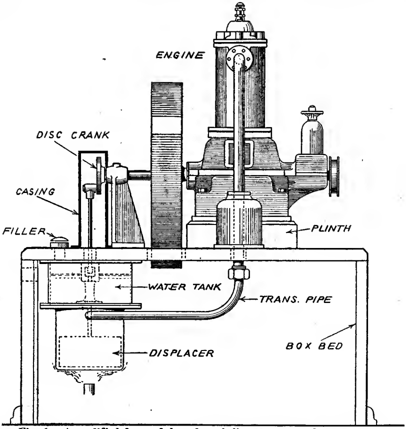


Fig. 6. A modified form of the "hot-air" system as applied to a model *vertical* Petter oil engine. The displacer drive is taken from an extension of the crankshaft. (Front of box bed is removed.)

* *Continued from page* 307, "*M.E.*," *October* 16, 1941.

excite unusual interest by the fact that it was a real "heat" engine and not a mere motor-operated dummy. Will some maker — Messrs. Crossley Bros., Messrs. Ruston-Hornsby, perhaps make a note of this suggestion, or better still, act upon it?

Conclusion

In bringing these remarks to a close, the writer deems it desirable to make a particular point of his attitude of mind towards the proposition which has been discussed. It is not at all his intention that any of the schemes outlined shall be slavishly followed, they need not be taken as more than mere suggestions. The model high-pressure Diesel heat engine, however, is an obvious impossibility, as has been shown; the model low-pressure heat engine—customarily referred to as a hot-air engine—is by no means *an impossibility*. It is a machine that can hardly be expected to fail in its operation. It is a machine ready at a moment's notice to register motion and, finally, it is a simple, satisfactory, safe and silent working piece of mechanism—well adapted, surely, to the purpose ascribed to it in this article—which is now concluded.

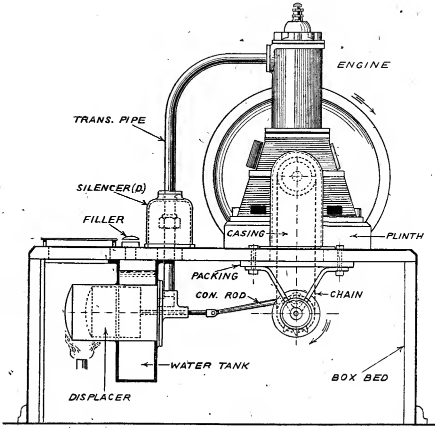
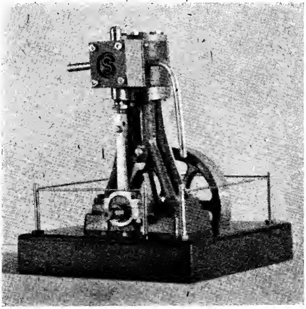


Fig. 7. A modification of Fig. 6 in which the shaft operating the displacer is chain-driven from the main crankshaft. (Front of box bed is removed.)

A "Stuart" Model

THE photograph reproduced herewith is of a Stuart No. 10 steam engine I have recently completed. I am 17 years old, and quite a beginner in model engineering, this being my first attempt. The engine was built entirely on a treadle-driven 1⅝-in. "Super Adept" lathe with the help of a hand-wheel brace, taps, dies, and a few assorted files, from a set of rough castings supplied by Stuart Turner Ltd.

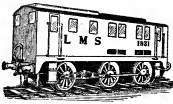
I hope this will help to encourage other model engineers not to give up their hobby until after the war, or beginners like myself not to postpone starting this interesting hobby.



I started model engineering just after the outbreak of war, and apart from a delay of several weeks, in the delivery of the lathe, I have had a clear road for the pursuance of my hobby.

The engine has been tested on air at 100 lb. pressure, and steam at 50 lb., and proves to be a powerful and fast model.—W. A. GOOGE.

[We endorse the hope expressed by Mr. Googe, and we commend his enterprise. He appears to have made an excellent job of this engine, and we look forward to his future efforts.—Ed. "M.E."]



1831 . . .

★A $3\frac{1}{2}$-in. gauge I.C. Engine-driven Locomotive

By Edgar T. Westbury

Clutch Housing

THIS component is in the form of a bronze or iron casting, machined all over, and, as in the case of the flywheel, it is most essential that it should run truly. It may be chucked by the inside of the rim for turning the outside and boring the boss ; note that the ball-race should be a fairly tight push-fit in the latter, and should bed home against the shallow ridge, which is of a suitable diameter and width to suit the flywheel nut. A $\frac{3}{4}$-in. stub mandrel is used to mount the housing for boring the other end, which should be a running fit over the flywheel boss, the radius at the mouth being machined to fit the fillet of the latter. The inside of the rim and other machining on this side can also be carried out at this setting.

If both the clutch housing and the flywheel are made of gunmetal, the wearing qualities of the sleeve bearing on the flywheel spigot may not be very satisfactory. The best remedy in this case is to turn down the spigot and press over it a steel sleeve to form the bearing surface. When either a gunmetal or cast-iron clutch housing are used in conjunction with a cast-iron or steel flywheel, no trouble should arise in this respect, so long as the bearing is kept lubricated ; this matter will be referred to later.

When the clutch housing is assembled on the flywheel boss and the ball race secured in position by a washer and set-screw, the parts should have free relative rotation, but without appreciable end-play ; a definite clearance should be allowed between the outer rims to prevent the possibility of rubbing.

The slots in the outer end of the boss of the housing are, as explained in Fig. 72, to take the die blocks of the universal joint, and the tapped holes are for the screws which secure the enclosing cover. These parts need not be made for the present, as they will not be required until the transmission gear is ready.

Eccentric Pivots

These may be made from mild steel rod, to the dimensions shown in Fig. 76. The exact amount of eccentricity is not highly important, so long as it is the same in each case, and the simple expedient of using a slip of packing in the chuck jaws may be adopted for obtaining it. Both the 3/16-in. and $\frac{1}{4}$-in. diameters should be dead parallel and well finished to fit the mating parts properly, the former being a tight push-fit in the holes in the flywheel. When slotting the heads of the pivots, it is advisable to locate all the slots in a definite position relative to the eccentric throw, as this provides a useful indication when adjusting them. The pivots may, with advantage, be case-hardened, but the extreme ends should be protected, so that they are left soft.

The pivot washers shown in Fig. 76 are simply for the purpose of keeping the clutch weights clear of the flywheel face, and ordinary $\frac{1}{4}$-in. washers may be used, provided that their thickness is suitable.

Locking Screws

Something rather better than mild steel is advisable for making these, as their duty is somewhat exacting. Annealed carbon- or silver-steel may be used, but does not take the threads very nicely as a general rule ; a tough alloy steel is better if it can be obtained. The squared head is recommended in preference to a slot, as it allows more purchase to be obtained, with a suitable key, but it must be sunk clear of the flywheel rim, in any case. It will be found desirable to counterbore away the first $\frac{1}{8}$ in. or so of the tapped holes in the flywheel, to clear the key. Provided the correct relation between the screw and pivot holes is observed, no difficulty will be found in forming the waist of the screw to grip the pivot securely. It will, of course, be necessary to put all the screws in before inserting the pivots, and when the latter, and the weights, are finally assembled, the ends of the pivots may be lightly burred over to prevent their moving endwise, but not so tightly as to prevent them being turned readily when unlocked.

Spring Anchoring Studs

These consist simply of $\frac{1}{8}$-in. screws having deeper heads than usual, with a groove in each sufficiently wide to enable

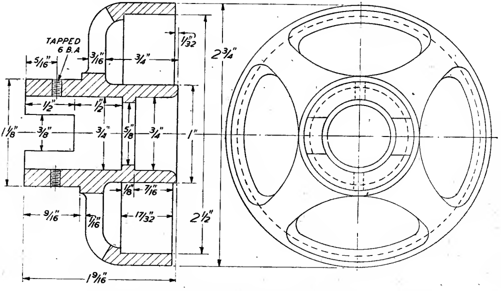


Fig. 75. Details of clutch housing (1 off).

* *Continued from page* 287, "*M.E.*," *October* 9, 1941.

two of the tension springs to be accommodated side by side. The threads should fit the tapped holes in the weights fairly stiffly, so as to reduce the risk of their loosening; or they may be made sufficiently long to pass right through the weights, and be burred over, or otherwise secured, at the back. As there is not much room to spare inside the clutch housing, it is advisable to check up before final assembly, to see that they have proper clearance and that the springs, when hooked on them, are clear of the internal boss of the housing when the weights are in the free position.

The springs are 5/32 in. diameter by $1\frac{1}{8}$ in. free length between hook centres, and may be wound from 26-gauge piano wire on a $\frac{1}{8}$-in. mandrel. In order to ensure that the coil closes up tightly, the turns should be "crowded" or underspaced when winding, so that the turn being wound *almost* rides on that adjacent to it. Great care should be taken to make all the springs the same length and number of turns, and the hooked ends should be turned up as short as possible, so as not to occupy more of the length of the spring than necessary. Spring making is quite a highly skilled job, and it is possible that first attempts at this job may be rather clumsy or otherwise unsatisfactory, but patience and perseverance will be rewarded in the long

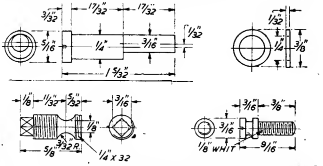


Fig. 76. Eccentric pivot and washer, pivot locking screw, and spring anchoring stud (4 off each).

run. As the spring tension governs the speed at which the clutch begins to grip, there is some scope for experimental work in finding the strength of spring most suitable for the purpose. If the springs are too weak the clutch may retain its grip until the speed of the engine has fallen below its safe limit, and, if too strong, it may have to be revved up to a higher speed than is desirable before engagement is effected.

Testing Clutch

It is possible to adjust and check up on the clutch action before the engine is installed in the chassis, or even before the clutch is fitted to the engine, if desired. In the latter case, it may be mounted temporarily on the shaft of an electric motor, for testing; but the latter must have some means of speed control, and also some method of indicating or counting r.p.m. Load may be applied by a brake of some kind on the clutch housing; carrying this idea to its logical conclusion, a torque arm might be added, to form a Prony brake, so that the transmission efficiency may be measured. As the automatic clutch prevents stalling, and also slips when overloaded, the principal objection to this form of brake for engine testing is thereby removed.

It will generally be found advisable to adjust the clutch weights, so that they drag slightly at the heel when in the free position. This ensures that the shoes engage progressively from heel to toe, and the contact area gradually increases, until they finally bear over their entire area when the clutch is fully engaged. The most suitable speed for the clutch to take up its action will depend to some extent on engine adjustment, but it will usually be found best if it starts to grip at about 700 to 800 r.p.m., and practically all slip is eliminated on normal load at 1,000 to 1,200 r.p.m.

The component illustrated in Fig. 77 comprises a combined crankcase oil filler plug, breather and dipstick, all the individual parts being simple and straightforward, as indicated by the detail drawings. No such particulars of the dipstick are shown, however, as it consists simply of a $3\frac{1}{2}$-in. length of $\frac{1}{8}$-in. brass or steel rod, screwed at one end for a length of $\frac{3}{8}$ in. and having a series of marking grooves turned near the other. These grooves should be sharply incised, preferably with a square-edged tool, such as a very narrow parting tool (a piece of broken hacksaw blade, held "close up" in a suitable holder and ground on the front edge only, will do the job quite nicely), as their object is not only to form a mere gauge mark, but also to hold the oil by surface tension when dipped in it, so that there is no question about which grooves have been immersed and which have been left high and dry. The positions of the grooves as indicated is to some extent arbitrary, but it is suggested that the top mark shows the highest level to which it is desirable to fill the sump, the next two moderately high and moderately low respectively, and when only the tip is immersed, the level is dangerously low. Needless to say, the dipstick can only be relied upon to indicate correctly when the engine is idle, preferably before it is started; it should be wiped dry before taking a reading, so that only the grooves which become immersed will hold oil. Care should be taken when screwing the top end of the rod, which should be done with the aid of a tailstock die holder so that the threads are quite true and concentric.

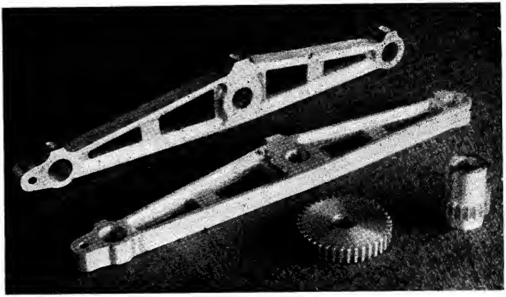
The cowl may be turned at one setting and parted off from a piece of brass or aluminium rod; after parting off, a second operation to clean up the head may be found desirable, in which case it can be screwed on a $\frac{1}{8}$-in. stud held in the lathe chuck, and lightly skimmed over the face and radius. A hand tool is most suitable for this job. It will be noted that the outer edge of the cowl is stepped back 1/32 in. behind the face of the screwed centre boss; this represents the limit of lift allowed for the breather disc valve, but if the material of which the latter is made is very soft and compressible, a little extra projection of the boss may be allowed to compensate for this.

For making the screw cap, similar material to the above may be used, and it may also be turned and parted off at one setting. It is advisable to screwcut the thread, so as to ensure it being accurately concentric, and a relief groove should be turned under the head so that it will screw right home to the shoulder in the hole in crankcase.

As an alternative to knurling the edge, it may, if preferred, be notched with the aid of a round-nosed tool held sideways on in the tool-post and used planer-wise; the work being indexed by means of a change-wheel or other convenient method. It is, of course, also practicable to file the notches with a small file, after previously making out their positions, but it is not so easy to make a really neat job in this way. Incidentally, a notched edge, if properly done, looks better than knurling and is probably more serviceable.

The six vent holes drilled axially through the cap should be spaced out as evenly as possible, and as close to the outside as can be managed without risk of cutting into the threads. After drilling them, the burrs should be removed from both ends, and it will be found desirable to true up the top face by taking a skim across it in the lathe. In the absence of a screwed bush for chucking the cap, it may have a strip of soft copper or aluminium sheet wrapped once round the threaded part, before gripping in the chuck.

The object of the baffle on the dipstick is primarily to prevent drops of oil being flung out of the breather, but



A pair of connecting-rods, machined from solid Birmabright aluminium - alloy, together with a pair of engine timing gears, by Mr. Ian Bradley.

it also centres the dipstick in the hole, and prevents any possibility of the screw cap entering the hole out of alignment and thus becoming cross-threaded. It may be made a press fit on the rod, or sweated in place; the "wings" of the flange should, of course, be quite concentric with the centre hole and a fairly good fit in the bore of the casting. The three notches may be filed if desired, as they do not have to conform to high standards of accuracy.

When the various parts of the combined component are assembled, a leather or Neoprene washer is interposed between the screw cap and the cowl, to form a non-return valve, which will allow air to escape freely from the crankcase when displaced by the pistons, but closes on the return stroke so that a slight vacuum is maintained in the crankcase and thus helps to prevent the escape of oil from bearings and joints. The use of a light compression spring over the disc, in the recess of the cowl, would promote its efficiency as a valve, but is liable to make it rather noisy in action, especially at low speed, and is therefore best avoided. When the cowl is put on it should not be screwed up unduly tightly as this is likely to spread or split the disc; it should be locked up by the top nut so that it cannot loosen inadvertently. It is advisable to check up the truth of the assembly by chucking the dipstick and running it in the lathe; if the baffle and cap show any signs of wobble, this should be corrected by any appropriate means.

Several readers have written to ask me whether full-sized blue prints of this model are or will be available, and I am in a position to state that the necessary arrangements to do this are being put in hand immediately. In view of the large number of drawings which are necessary to give full information on the complete design, it is proposed to issue the blue prints in four groups, comprising chassis, engine, transmission and superstructure respectively. Readers will appreciate that as this locomotive differs in so many respects from steam locomotive practice, a much greater number of detail drawings than is commonly used to describe a model steam locomotive may be regarded as necessary. The blue prints will embody several minor amendments and modifications which have been found necessary or desirable in the light of later experience, since the original drawings were published; in no case is it possible to issue prints which anticipate information published in the "M.E." By the time this notice appears, it is hoped that the blue prints of the outline, and of the chassis group, will be ready, and an announcement to this effect will be made by the "M.E." Publishing Department.

(To be continued)

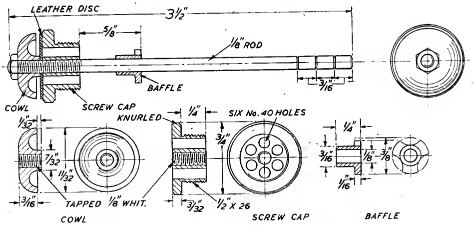


Fig. 77. Combined crankcase breather, oil filler and dipstick.

"Matters of Fact!"

By "L.B.S.C."

OTHER folk having commented and expressed opinions on Mr. V. B. Harrison's Great Western single-wheeler, maybe your humble servant might be allowed to chip in with a few words on both that and kindred subjects, in the form of another "lobby chat." Now when perusing the following comments and statements, I would like all followers of these notes to bear in mind that I am an *actual builder* of little locomotives; that is to say, I make them throughout, from castings (many off my own patterns) and material, with my own hands plus the necessary tools and machinery, in my own workshop. When the C.M.E. of a full-sized railway is said to have "built" an engine, it does not mean that he has *literally* built it, inasmuch as it is built either in the Company's own workshops, or by an outside firm, to the C.M.E.'s design; this interpretation has been put on my own work, and that of others, but in my own case the actual facts are as stated above.

Having "cleared the air," so to speak, we can now get down to "brass tacks." I can say from experience, without hesitation, that there should not be the slightest difficulty in building an engine of the above-mentioned type to the correct scale for the gauge, *viz.* ⅜ in. to the foot, and keeping to the proper measurements throughout. Increasing the scale to 10½ mm. is almost equivalent to putting a 2-in. gauge engine on 1¾-in. rails, and is "tipping the scales the other way" to the equally wrong "½-in. scale 2½-in. gauge" business that annoyed many good folk, including Mr. J. N. Maskelyne and your humble servant. I fail to see why the boiler should be the main trouble, having proved over and over again that the old-fashioned ideas about "the largest possible boiler" being required, is a complete fallacy. It is the *engine* part that matters; and if the engine is properly designed and constructed to give the maximum efficiency for the minimum steam consumption, then a boiler the correct size for the particular type of engine, will provide all the steam required. I can give many instances which actually prove this, from my own personal experience; but one little bit of "ancient history" should suffice to prick the "big boiler" bubble.

A Successful Conversion

Somewhere about 1926, a Yorkshire friend brought a gauge "1" 2-6-2 tender engine to my old home at Norbury. It was a professionally-built job, with cylinders 7/16 in. bore, ⅝-in. stroke, 1⅞-in. driving wheels, and a water-tube boiler having an outer casing no less than 3 in. diameter (8 ft. in full size!) and an inner barrel 2¼ in. diameter with four water tubes. It was fired by a six-wick spirit lamp, the running boards being cut away and the sides of the casing brought straight down, to accommodate the burners. The appearance of the engine was absolutely awful; in fact, it looked something like the one shown on page 130 of the *Model Railway News* for May, 1924. Despite this fearsome kettle, the engine would not perform anything like it should have done, and it was as much as it could do, to keep going with three or four coaches.

My friend said frankly he did not like the appearance of it, and could it be altered to the proper outline of some existing engine, say a 2-8-0, with a correct size boiler. He already knew what was possible, as I had converted a commercial Pacific for him. I said yes, I could turn her into a Great Northern 2-8-0, which pleased him very much. The trailing truck was scrapped, the frames were lengthened, and an extra pair of coupled wheels added. The whole of the cylinders and motion, which were of the "generally-accepted-standards" variety, were also consigned to limbo, and I made and fitted a new pair of ½-in. bore cylinders, with my own ideas of valve gear and valve setting. The outsize boiler followed the rest of the junk, and a new "Great Northern" boiler, with a casing as near to "scale" as possible, was fitted; this had an inside barrel about 1½ in. diameter, to the best of my recollection, and only three water tubes. The outer casing was made from sheet steel, and asbestos lined. The number of burners was halved, using three only, in single file. As Mr. Harrison—and Mr. Gubbins—says, "to cut a long story short," the rebuilt engine with its much smaller boiler and *larger* cylinders, now hauled sixteen bogie coaches for 35 min. non-stop at high speed, without putting any more water whatever in the boiler, which is impossible whilst running, for the engine has no pump. I last heard of this engine in May of last year, and she was still doing the job in the same efficient manner, having had no repairs of any sort.

In due course, for the same friend, I rebuilt a "Jubb" gauge "1" G.N. "Atlantic" with a "scale" boiler and ½-in. bore cylinders, and then a 4-4-0 by the same professional that made the freak 2-6-2; and on this one I fitted 9/16-in. bore cylinders. Neither of these engines had pumps, yet they would haul twelve bogie coaches for over the half-hour non-stop at high speed. Later I reboilered the commercial Pacific which I had already fitted with my own cylinders and motion, putting as large an inner barrel as I could get into the "scale" casing, which killed two birds with one shot, as it effectively disposed of the "fixed-ratio-inner-barrel-to-outer-case" fallacy, and gave a non-stop run of over 40 min. with sixteen coaches. I don't know the weight of the train Mr. Harrison uses for his tests, but my friend gives the weight of his 16-coach train in running trim, as just over 50 lb.; and when this train is on the curves, it forms a complete half-circle. The coaches run on ordinary plain bearings.

The upshot of all this was that my friend asked if it were possible to build a G.W. single-wheeler of the "Worcester" class, to run for an hour no-stop with a scale-length train. I said without hesitation, "Yes, if you will have a pump on the engine." He had hitherto had a rooted objection to pumps in any form, either hand or mechanical, and it was only after reboilering his Pacific that I persuaded him to have a hand-pump in the tender. After a certain amount of preliminary "h-m!-ing and ah!-ing" he finally agreed; but I could not give him any delivery date, because for one thing, I had no suitable castings for the job, and no time to make patterns; also, I hate building spirit-fired engines anyway. What with this writing and drawing, and the experimental and other work in connection with it, my plate is pretty full. However, I started to get the necessary oddments together for the job, and managed them all except the driving-wheel castings. Mr. Harrison has now kindly stepped into the breach by offering the loan of his patterns; so, provided I am spared, and can keep clear of the loonies' home, the little engine stands a chance of materialising. I don't anticipate any trouble whatever; the cylinders will be bigger than those on Mr. Harrison's engine, there will be no bell-crank drive to the pump, no skew-whiff eccentric-rods, and the boiler barrel will go nicely between the driving wheels without any necessity for scheming extra eighths and sixteenths on the diameter. Experience still teaches!

"The Others" Got There First!

On page 186 of September 4th issue, Mr. Harrison writes:

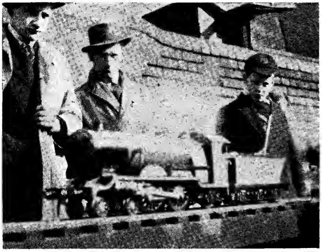


Photo by] [*W. Finch*
Birmingham "meet"—Mr. Johnson's *Ayesha*.

"Mr. Courtice has maintained that, with the knowledge gained over many years of experience, a scale-sized boiler will steam scale-sized cylinders. He *and others* (my own italics) have proved their contention in 2½-in. gauge, but in gauge '1,' matters did not look quite so promising." Anybody not conversant with little locomotive history, would be led by the above statement to think that our friend mentioned was the first to prove that contention; but he wasn't, by long chalks. Your humble servant made the claim twenty years ago, and was laughed at by all the "experts" of the period. Some time after demonstrating 2½-in. gauge passenger-hauling with the engine later named *Ayesha*, I took to the Caxton Hall, and ran on the S.M.E.E. track, a "⅜ scale" Stirling eight-footer with a coal-fired boiler of "scale" dimensions, which "astonished the natives" by the way it made steam and blew off whilst running; this engine was, to the best of my knowledge and belief, the first fully-successful locomotive of this type and size which had ever performed in public. Anyway, I recollect the remarks of various members recalling what others had said about the "impossibility" of making a success of such a small-boilered engine; and when, with the late Driver Irvin at the regulator, the safety-valve blew off so violently that it lifted the heavy brass casing right up to the rafters, a whole cartload of "generally-accepted theories" went up with it!

Subsequently to that, I took up several 2½-in. gauge engines with boilers of correct size, all of which made more steam than the cylinders could use, and then came a gauge "1" engine, a 4-6-4 tank. This also had a "scale" boiler and was coal-fired. True, the boiler was bigger than that of Mr. Harrison's single-wheeler; but then the cylinders were 9/16-in.. bore, and the engine hauled, not a few light coaches, but an adult passenger on a flat car. Later on, a friend at Bournemouth had it, and ran it on a continuous "scenic" track laid out in a large cellar. He told me it ran away with every bit of rolling-stock he had, a train of L.M.S. bogie coaches and about two dozen four-wheeled wagons, all loaded up. Incidentally, that was the last engine I ever took to the Caxton Hall. Between then and the present time, I have rebuilt several gauge "1" "duds," and also built several new gauge "1" engines, the last of which was an oil-fired Southern 2-6-0 of class "N," for a friend at Cardiff, to wit Mr. S. Y. Knight, *alias* "Bro. Longhedge." The boiler of this engine is not much bigger than that on the single-wheeler, but the cylinders are ⅝ in. by ⅞ in., and on test she hauled a kiddy of about 6 stone for a mile and a quarter. She also hauled adult passengers at the Cardiff S.M.E. exhibition. With such a backing of actual personal experience, followers of these notes can easily understand why I fail to see any reason for boiler enlargements or any other subterfuges, such as increasing the "scale," to make a success of a gauge "1" single-wheeler.

Using Steam Instead of Wasting It

On page 208 of September 11th issue, appears the statement, "To talk of expansion of steam in model cylinders is pure rubbish." That sentence can best be described by repeating the last two words, and so can the following sentence, "The ⅝ in. diameter takes at least five times the normal 100 per cent. cylinder-full at every stroke." Now, in my early days of locomotive building, when in the innocence of my heart I believed everything I read on the subject of locomotive building, I was led into believing that early cut-off in small cylinders was unnecessary, and arranged my valves and gear according to writers' designs. It was then I found out why they always advocated the biggest boiler that could be put on the frame, for it was a practical impossibility to maintain full pressure even with the engine running light. I well remember reading in this journal the delighted account of how Mr. Rompler's single-wheeler eventually managed it, running without load; and when Mr. Fred Smithies' single-cylinder tank engine managed it with one coach as load, the cheers were louder still. I managed to get a little Brighton "Jumbo" to do it, but the amount of fuel and water she used was absolutely awful. It was then that I began to "hae ma doots" about what was written; and could not, for the life of me, see why an early cut-off should not be as effective in saving steam, and consequently fuel and water, in a little engine as in a big one. I knew the drivers who ran with the lever nearest the middle got the most coal-money each month!

Eventually I determined to try the same arrangement on the little engine, as obtained on her big sister, and made new valves, with lap and lead setting, to cut off at 75 per cent. in full gear. The result was so amazing that I could

Photo by] [*W. Finch*
Birmingham "meet"—Mr. Boll driving his *Princess Marina*.

hardly believe it! The engine was absolutely transformed—she ran like a deer on little more than a breath of steam, whilst the erstwhile heavy dull exhaust became a snappy crackling purr, and the fuel and water consumption dropped to a fraction of what it previously had been. Having found the key to the gates of success, I took good care to make use of it in all my subsequent work; and that, coupled with the experimental and research work I have carried out with small valve gears and settings, will explain why my own engines, and those built strictly to my instructions, never fail to do the job. Full use is made of every bit of steam that enters the cylinders.

Rebuilt Engines Give Proof

During the last 20 years I have overhauled and rebuilt many engines, commercial, professional, and amateur-built, many of them originally to the design of the author of the statement referred to. Practically every case of bad steaming was due to excessive waste of steam in cylinders and motion of the 100 per cent. cut-off variety. Every one, without exception, has been made efficient by providing early cut-off, and making full use of the steam by expansion, even in gauge "O." Recollect Mr. Thomson's two "O" gaugers? The 4-4-0 could not maintain steam with three coaches; the 4-6-2 could just manage five with a struggle, but would run for a few minutes only. They were "high-pressure" jobs built by a firm of repute. When I had finished with them, the 4-4-0 would haul sixteen coaches, and the 4-6-2 no less than twenty-seven, from 16 to 18 minutes without putting a drop more water in the *unaltered* (note that!) boilers, and using the original burners. This result was obtained solely by boring out the cylinders to the largest possible diameter (a bare ⅜ in. in each case) and using an early cut-off. Seeing is believing; representatives of the firm saw them perform and could hardly believe their own eyes.

Experiments have been made, by builders of engines who have followed my instructions, both on my road and on their own, by running an engine first in full gear, and then notched up, to note the difference in fuel and water consumption. When running in full gear, one pump can just manage to keep the boiler supplied, and the firebox needs constant firing, yet when notched up and running with the *same* load at the *same* speed, the bypass has to be opened three parts to prevent the boiler flooding, and very little firing is needed. It doesn't need a Sherlock Holmes to deduce that far less steam is used when cutting off at 25 per cent., than when cutting off at 75 per cent., let alone 100!

The condensation idea can be given a back seat! Proof? Why, certainly! A builder of one of the engines described in the "Live Steam" notes wrote me that he had difficulty in fixing up his steam and exhaust connections, and as he stripped the threads on the pipes and did not wish to make a fresh lot, he soldered over both sets of pipes and tees. The engine had my usual spearhead type firetube superheater. On the trial trip, the solder melted and blew out of the steam tee, and the exhaust showed signs of having gone plastic. Nobody is going to tell me that cylinder condensation is present when things like *that* happen! The last time I took a look inside old *Ayesha's* cylinders, the bores, though smooth as glass and oily, were all sorts of pretty colours, and there were traces of carbon on the pistons.

No; despite all arguments to the contrary, actual personal experience has taught me that for *maximum* efficiency on a little locomotive, you need (in addition to good workmanship) correct valve gear and setting, a free exhaust, adequate lubrication, and good hot steam; having those, there is no need to bother about adding sixteenths of an inch to the diameter of the boiler barrel!

Notes on Taps and Tapping

UNTIL a few years ago, the only taps available for threading small holes were those on which the threaded part was finished before hardening. It is well known that the hardening process introduced many errors in the tap thread, and hence, if the thread cannot be finished after hardening, the cutting qualities, durability, and accuracy are impaired. Until the development of a tap ground in the thread after hardening, it was impossible to eliminate the inaccuracies inherent in the tap finished before hardening. To appreciate what these inaccuracies are and how they are avoided by the use of taps ground in the thread, it is necessary to understand what difficulties are most frequently encountered due to taps not being ground in the thread after hardening. When, as is usually the case, the fluting of a tap is done after the threading operation, burrs are generally found between the threads. It is extremely difficult, with the most careful fluting and flute grinding operations, wholly to remove these burrs.

In general, taps are made with either four flutes, three flutes, or two flutes, the number depending largely on the size of the tap, and to some extent on the material to be tapped. Taps are tempered hard and are consequently brittle. They give no warning before they break, therefore care and judgment must be exercised in their use. In using hand taps, a wrench which fits closely the square on the shank, and having opposite handles of equal length should be used. The pull on the handles should be uniform and equal. This produces a torsional strain in the tap, which, if working under proper conditions, it will safely resist. Any excess of pressure on one handle will produce a transverse strain which endangers the tap.

It frequently is necessary from the nature of the work to use a single handle. In such cases the mechanic should grasp the head of the tap and wrench with his left hand and balance the transverse moment of the pull at the end of the handle, allowing only the turning effort to be received by the tap.

Taps, like all tools, have their limitations. It is usually difficult to determine the exact limit of a given tap. The following is a table which shows the proper number of flutes for taps in threading aluminium, steel, and cast iron.

Size	Aluminium	Steel	Cast Iron
¼	2	2	2 or 4
5/16	2	2 or 3	2 or 4
⅜	2 or 3	3 or 4	2 or 4
7/16	2 or 3	3 or 4	3 or 4
½	2 or 3	3 or 4	4

Not infrequently small taps fracture while tapping a hole. This is troublesome, because sometimes the tap seizes in the hole and may have to be annealed and drilled out. To prevent these breakages, the correct size of tap drill should be employed. If the hole is too small the tap is given more work than is necessary, and is likely to bind in the hole, itself a frequent cause of breakage. The starting or first tap should do all the work it can, so that no more is thrown on the second and third taps than is good for them. When tapping threads in steel by hand the tap should after every two or three turns forward be given a slight turn back. This allows the removing of the cuttings and allows the lubricant to find its way to the points of the teeth. One of the most vital features in the life of the tap is lubrication and its mode of application. Suitable lubricants for tapping various metals were given in an article in this journal dated November 14th, 1940.—A.J.T.E.

★ Small Capstan Lathe Tools

Notes on " tooling up " for repetition work, with special application to the small capstan attachment recently described in the " M.E."

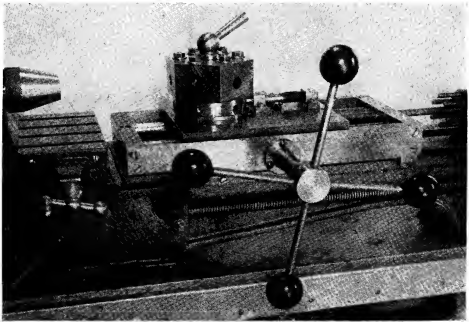
By " Ned "

The " M.E." Capstan Attachment

IT is evident, from the opinions expressed by readers, that this device has been given a warm welcome, and reports have been received of several attachments, either under construction or completed. As might naturally be expected, some constructors have adapted the idea to their own requirements, and in one case, it has been considerably elaborated and improved in detail; the result is highly successful, and is illustrated here as an example of how this simple utility design can be developed into a piece of high-class machine-tool equipment.

The constructor of this attachment, Mr. A. L. Steels, of Cheam, Surrey, has adapted it to a 3½-in " Grayson " lathe, which, by reason of its particular features of design, called for some modification in the method of mounting the slide frame. It was thus found desirable to enclose the latter completely with side plates, and a logical addition to the scheme consisted of a rack and pinion traversing gear, using the conventional " windlass " in place of the simple lever feed. A rather interesting detail is that the primitive form of gear described for indexing the capstan stops has been found perfectly satisfactory for working the slide; the rack, which is attached to the underside of the latter, consists simply of a flat bar with holes drilled at even intervals to engage the pinion teeth.

A further improvement in the device consists of automatic indexing gear for the capstan head, which is devised on the principles illustrated in the " M.E." handbook, " Capstan and Turret Lathes," and works quite satisfactorily. It is understood that Mr. Steels will be submitting a full description of this attachment in due course, but in the meanwhile, the photograph will undoubtedly serve to assist other readers who may be contemplating similar improvements.



A capstan attachment, based on the design published recently in the " M.E.," constructed and fitted to a 3½-in. " Grayson " lathe by Mr. A. L. Steels.

* *Continued from p.* 296, " *M.E.*," *October* 9, 1941.

Tips on Toolmaking

One or two readers have enquired whether the toolholders and bits for capstan lathe work can be obtained ready-made, and, if so, where to obtain them. It is, however, very difficult to give helpful advice on this matter because although a wide range of accessories of this nature is listed by most manufacturers of capstan lathes, and miscellaneous items are supplied by makers of small tools, all such parts are now controlled by Ministry of Supply Regulations and can only be obtained by special permit. Even if this were forthcoming, however, it is doubtful whether the firms concerned, already overwhelmed with urgent orders, would welcome enquiries from small users for items of non-standard equipment. In any case, the practical advantages of being able to obtain the tools ready-made are by no means as considerable as they seem, even apart from the inevitable delays in delivery, because there are so many small jobs where a simple tool, knocked up quickly to serve a particular purpose, is far more handy and efficient for that purpose than a very elaborate ready-made tool which has been designed to suit general, rather than special, requirements. In production practice, although there may be all sorts of tool holders and equipment available, and kept fully occupied, too, the works tool room finds plenty to do in making up simple tools for special purposes, and it may be said that inability to cope with such work would seriously reduce production efficiency in any factory.

In the small production schemes contemplated within the scope of these articles, there is very little excuse for the user of the lathe or attachment not being able to produce such tools as are required. Model engineers so often have to be their own toolmakers that few of them will even anticipate serious difficulty in this respect. But to those who say that they have never attempted any toolmaking, well, here is a

good chance to make a start. You remember the classical advice given by the officer on the sinking ship to the passenger who couldn't swim—"Now's your dash blank chance to learn!" Which may be interpreted as a terse, brutal way of expressing the old saying that necessity is the mother of invention.

The holders which are described in these notes can be made up from various odd bits of material which may be available; in most cases the exact size and shape, except as regards the shank which fits the capstan holder, are immaterial, so long as the tool bit can be held in the appropriate position, and any steadies provided can be applied to the range of work for which the tool is designed. It is fairly certain that, whenever it becomes necessary to make a tool for a special job, that tool will be found useful for another job later on, possibly with slight adaptation; so that the possibility of making all tools more or less adaptable should always be kept in mind.

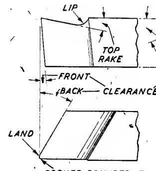


Fig. 4. Form of cutter suited for most capstan lathe operations.

Making Cutters

Tool bits can most economically be made from short pieces cut from stock tool steel bar; many grades of high-speed steel are supplied ready tempered, and require only to be cut off and ground to shape, with due care to avoid drawing the temper. The common practice of nicking the steel on the corner of an ordinary grinding wheel and breaking it off is rather wasteful of material and time as it necessitates a good deal of work in grinding, and increases the risk of overheating the steel in the process. It is best to obtain a special narrow wheel, of a grade designed specially for cutting off, and use it in the prescribed manner. By cutting the bits off at a slight angle in one or both planes, the amount of grinding required can be very much reduced. Most classes of capstan work call for a tool ground to cut on the side—practically a right-hand "knife tool"; (Fig. 4) the front edge being bevelled away to a fair angle of clearance, leaving a narrow "land" or facet at the tip which can readily be honed with a hand slip to keep the edge keen. Besides helping to produce a clean finish, this treatment also reduces the prevalent tendency of a knife tool to snatch forward and dig in when machining certain kinds of materials. Very often minor adjustment of the size of the work can be made more readily by honing the edge of the tool while in the holder than by shifting it. The sharp corner of the tool should also be very slightly rounded by honing, unless the specification of the work definitely calls for a sharp internal angle. Rake and clearance angles follow exactly the same rules as those for ordinary turning tools, but it may be noted that the common errors of excessive clearance and insufficient rake should be studiously avoided. Generally speaking, a fine clearance angle is conducive to long wear and fine finish.

In view of the small size of the bits, the use of some form of grinding gauge or jig will be found very useful, not only to facilitate handling, but also to economise tool steel and reduce the time taken in regrinding. Tools used for working steel, and thus having top rake, may with advantage be "lipped" by grinding on the corner of the wheel, so that they turn the chip as it comes off the cutting edge. This helps to throw the swarf clear of the work and promote smooth cutting action, also to counteract the tendency, which is often encountered in box tools and other enclosed holders, for the swarf to pack or jam round the work.

Tools made from carbon or silver-steel will, of course, have to be hardened and tempered. For instructions in carrying out this work, the writer cannot do better than refer readers to the "M.E." handbook, "Hardening and Tempering," which explains all the necessary processes for dealing with any kind of tool steel likely to be encountered.

One final hint about tool bits will not be out of place: always smooth off the reverse end of the bit which projects out of the holder. Rough, jagged edges left here account for many accidents, and the most carefully laid scheme for quick production is liable to go sadly awry if the operator is laid up with a septic finger.

Clamping Screws

It will be noted that some of the tool holders illustrated are equipped with headless, socketed screws of the type which are supplied, under various trade names, especially for such purposes as these. On the grounds of safety and security, these can be strongly recommended, but under present conditions there may be some difficulty in obtaining them, and they are by no means easy to make in the amateur workshop. The next best thing is a square-headed steel set-screw, as shown in some of the fittings, and these can be made up as required from square steel bar stock. A good quality steel is advised, and in view of the desirability of reducing the size of projecting parts, the heads may be only slightly larger than the screw diameter, or even the same size. The points should be faced off dead square, and well bevelled off so that the threads do not get burred over by end pressure. It is an advantage to case-harden the heads and points of the screws, but the threads themselves are best left soft, in case they become brittle when hardened and thus tend to break away from the core. Of course, high-tensile screws, tempered all over, would be better still.

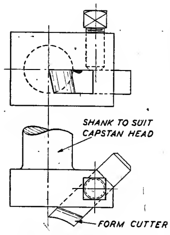


Fig. 5. Simple end-forming tool holder and cutter.

It will usually be found that B.S.F. threads are more suitable than Whitworth for these set-screws, mainly because, if they are stressed to the point of breakdown, it is better that the threads should strip than that the screw itself should twist off in the hole.

End-forming Tools

When producing such parts as small screws and bolts, it is often necessary to round or bevel off the end face; this may be done either before or after turning down, and with a tool applied either from the capstan or the cross-slide. The facing and centring tool holder shown in Fig. 3 may be adapted for end-forming by equipping it with suitable cutters in place of the plain flat-facing cutters shown.

(Continued on next page)

Soldering Fluxes for Soft Solders

By Ashley J. T. Eyles

AMONG the many metallurgical processes with which we have to do in model engineering, the process of soldering is one of the most familiar. As ordinarily defined, soldering is a process whereby two pieces of metal are joined by another metal or alloy, having a lower melting point than the metals joined.

In order that metals soldered together may be securely held, it is necessary that there be more than mere adhesion between the solder and the metal. There must be an alloy formed between the metal and the solder. In order that this alloy may be formed, the surface of the metal must be entirely free from any foreign substance as oxides, oils or various solid matter. Since it is not always convenient, or we do not care to take the time to clean mechanically the metal surfaces to be soldered, we resort to the use of various chemicals to clean the surfaces.

There are many soldering fluxes in practical use, and each has its peculiar advantages and disadvantages. Soldering fluxes should not be used indiscriminately, but, should be determined by the nature of the model work. If brass, copper, bronze, gunmetal, tinplate or steel is to be soldered, zinc chloride, resin, or ammonium chloride (sal-ammoniac) may be used, for galvanised iron or steel, or zinc, hydrochloric acid, or a strong chloride of zinc solution may be used. The rapidity with which a soldering flux acts is an important factor in its usefulness. If the flux be in the form of a dry salt, a comparatively high heat is necessary to fuse it. If an aqueous solution be used, a certain amount of heat is essential to evaporate the moisture. The essentials in a soldering flux are: (1) that it shall be a deoxidiser, i.e. it must attack and remove the oxide film on the surface of the metal; (2) it must remain fluid at the temperature of the molten solder, so that it may float away any impurities; and (3) it must have a purifying effect on the metals themselves.

Zinc chloride has several properties which make it a valuable soldering flux for most model work, as it remains liquid when the solder is molten, thus being in a condition to act upon the oxides very readily. Some model engineers add a small quantity of water to zinc chloride flux, but that is detrimental, because the stronger the flux can be made and still remain liquid, the better it will be.

To make zinc chloride solution, dissolve clean metallic zinc (preferably in small pieces) in hydrochloric acid until the acid will not take up more. An earthenware or lead vessel should be used and, if possible, the operation should take place in the open air, because immediately the zinc is placed in the acid, violent "boiling" takes place and choking fumes (hydrogen gas) are given off. The zinc should lie in the acid for several hours, when any excess may be removed, and the flux is ready for use. Zinc chloride is corrosive and it has a burning action on the skin, it should not be used when soldering electrical models, as it frequently contains free acid. In all model work where this flux is used, the surfaces should be thoroughly washed and dried after soldering to prevent the acid action after the job is done.

On the market are several non-corrosive fluxes. Some have zinc chloride as a base. This is dissolved in a fluid or semi-fluid which will not form an electrolyte. Vaseline is a favourite in this respect. The materials are worked together, a little water being added to emulsify the whole. If the experiment be tried the peculiar thickening effect of a few drops of water will be observed. Sometimes flux of this kind is used in the form of sticks. Paraffin is the base in this case. Of the many other fluxes, resin, tallow, glycerine, olive oil, and phosphoric acid are a few. In the soldering operations the writer has had to do he has come across only one (except the proprietary flux Fluxite) that is truly non-corrosive, namely ordinary resin; but as a flux this leaves much to be desired; with resin the solder has frequently to be coaxed to flow freely. Generally, the resin is dissolved in alcohol, methylated spirits.

Aluminium solders are best applied without a flux, after preliminary cleaning and tinning of the surfaces to be soldered. Stearin may be used for the tinning operation. Many patent fluxes for soldering aluminium containing Venice turpentine, capaba balsam, paraffin oil, etc., in specified proportions, have been tried by the writer without good results. In fact, as mentioned in the article "Practical Hints on Solders and Soldering," published in August 1, 1940, issue of this journal, "No soft soldering flux has yet been discovered that will allow aluminium to be soldered with the same speed and reliability as can be attained in soldering brass, copper, etc., with ordinary commercial fluxes."

Small Capstan Lathe Tools

(Continued from previous page)

It is, however, simpler to shape the end with a single cutter in cases where it requires to be rounded or otherwise formed to a particular shape, because the matching up of two form cutters is always somewhat difficult. The tool shown in Fig. 5 will be found very suitable for this job, and can be made up quickly from a piece of rectangular bar, with the shank end either turned down or inserted, according to which is the more convenient. It may be remarked here that when building up these holders, the shanks will be quite satisfactory if pressed in, provided that they are really well fitted. They may be taper-pinned or set-screwed for further security, but for a really sound permanent job, brazing is recommended.

The cutter, which may be either of round or square section, should be a close fit in the hole in the holder, so that it is not liable to shift when clamped by the set-screw. It may be filed up on the end to the required radius form, using a standard radius gauge for reference. There is something to be said for using round section cutters on such jobs (although they are rarely used in production practice), as it is possible to turn them slightly, to adjust the point to coincide with the work axis, and thus avoid leaving a "pip" in the centre. An advantage of setting the cutter in the holder at an angle is that a comparatively small diameter cutter will cover a much larger radius of work than is possible with an axial-located cutter, and is also adjustable towards or away from the centre.

End-forming tools, or as they are generally termed in machine-shop vernacular, "ending tools," are in some cases combined in a single holder with other tools, such as turning or running-down tools, by the addition of an extra cutter which operates only at the end of the travel. In some kinds of work it is found convenient to end-form the work by means of the parting-tool, which is made of special shape, so that it leaves the end of the bar suitably formed before it is advanced up to the stop; or alternatively a form tool may be used opposite the parting-tool for the same purpose. Again, screwed work may call for two ending operations, one before screwing, and the other afterwards, to remove the burr thrown up by the die.

(To be continued)

Improving Lathe Design

By E. T. Westbury

I HAVE taken a very keen interest in the discussion on this subject, which has been in progress for some time in the "Practical Letters" columns, but for personal reasons, I have not hitherto deemed it prudent to butt in. In the letter by "R.V.B.", in the September 25th issue, however, I am given a personal invitation to express my views on the matter, and I will say at once that I have no objection to doing so, provided that they are regarded purely and simply as a personal opinion, and not intended in any way as an assumption of authority to speak on behalf of other readers.

There are few subjects where the proverb "one man's meat is another man's poison" is more appropriate than in the matter of lathes. In the course of many discussions on this subject with both amateur and professional users, I have found that what one person considers to be the best lathe in existence, is wholeheartedly condemned by another of equal skill and experience. Our opinion of what constitutes merit in the various features of a lathe is bound to be influenced, not only by the class of work we normally handle, or anticipate having to undertake, but also by individual methods of approach to engineering problems. For this reason, I am extremely doubtful whether the "ideal lathe" can have any real existence except as a purely individual conception; and it can be taken as a foregone conclusion that any "improvement" put forward in any part of the design of a lathe will be regarded as a retrogression by some of the people qualified to judge.

So far as the basic factors of lathe design are concerned, it may be perfectly true that "the amateur's lathe is not much of an improvement on the original screwcutting lathe in the Science Museum" (*vide* Mr. R. J. Clift, in the March 20th issue). But this is more a compliment to Maudslay and his contemporaries than a derogation of subsequent designers. The pioneers of machine tools had wonderful foresight in grasping the essential requirements, and practically all that they failed to allow for in their designs was the increasing tempo of industrial production, and the specialisation of tools for single- or limited-purpose work. As neither of these conditions apply with very great force to the lathes used in model engineering, the embodiment of these basic principles results in a perfectly satisfactory lathe for the desired purpose, *provided that it is properly and accurately constructed*. I am prepared to say that the design of lathe produced by Sir Joseph Whitworth, constructed to present-day standards of accuracy, and with minor detail modifications, would be equal to anything required by the average model engineer.

It would be idle to deny that lathes—or anything else for that matter—are capable of improvement, and by all means let us do all that we can to improve them; but to take up the attitude that the lathes we have hitherto had (even the cheapest ones) are completely dud, and must be scrapped, is in my opinion entirely wrong. Neither am I prepared to agree that lathes have not improved during the history of model engineering; on the contrary, not the least encouraging circumstance has been the way in which quite practical lathes have been developed so as to be available at extremely low cost. What if these lathes have had their faults, glaring ones at that? There are thousands of amateurs who can testify that in spite of their limitations, they have proved capable of doing the work required of them.

Another point which must never be forgotten is that nearly every one of the improvements called for by the critics would add something to the cost of a lathe, and their cumulative effect might be rather startling in this respect. I have had many discussions with people who "cannot see" why such items as a larger diameter mandrel, better bearings, or a more massive bed should put up the cost of a lathe, but I assure them that they would if they had to produce it!

Again, many readers may say, "But I am quite prepared to pay for all these improvements." That may be so, but are they *quite* sure that they are speaking as an authorised representative of the bulk of prospective buyers? I am strongly of the opinion that cheap lathes, whatever their imperfections, are a *necessity* for the progress of model engineering, just as cheap cars are necessary for the progress of motoring. If everyone had to pay out about £150 or so to equip a workshop, there would be comparatively few recruits to model engineering. And here I will inflict another truism on my readers: it is not necessarily the man with the best-equipped workshop who produces the best workmanship!

Even if we dissociate the improvement of design from the matter of cost, it is possible to show that it may not always be an unmixed blessing. Much depends on why we want it, and how we use it. The professional engineer demands continual improvement and increasing capacity of machine tools, for obvious reasons, connected with keen competition in industry, and in many cases, the deficiency in the skill of workers. But to the amateur, the lathe is not only a means to an end, it is a very worthy end in itself; and it is quite conceivable that some improvements, highly desirable in themselves, may have the effect of making the manipulation of the lathe less interesting. In case this statement sounds ridiculous, consider how much real pleasure can be obtained by wangling and contriving methods of carrying out "impossible" jobs with inadequate equipment.

If our object in demanding improvement in our lathes is simply to make it *easier* to obtain the desired results, or reduce the skill required in their manipulation, then I say that, as model engineers, it will benefit us nothing. To the person who complains that his lathe is "incapable" of boring a cylinder truly, or turning a shaft parallel, I am inclined to ask, in all seriousness, "Are you an engineer—or just a slave of the machine?" I would assure readers that I, in common with some thousands of others who have had to earn their bread and butter with the aid of the lathe, have on occasion had to do both jobs, to very exacting limits, on machines far less inherently accurate than those used by the average amateur. It is a fallacy to assume that industrial engineering—in which both accuracy and speed *does* matter—is always carried out with the most up-to-date precision equipment, and many amateurs who have taken up work in factories have found this out.

I trust that readers will not jump to the conclusion that I am dead against all suggestions for improving the model engineer's lathe, but when all is said and done, we have still to convince the lathe manufacturers that these suggestions—which are not new to them, anyway—are not only practicable, but also profitable. Speaking from some inside experience of the machine-tool industry, I have

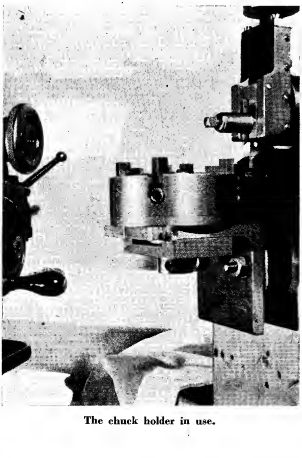
(*Continued on next page*)

A Chuck Holder
for the Shaping Machine

By C. J. Fisher

FOLLOWING the machining of a part in the chuck, it frequently occurs that a portion has to be rendered square, hexagonal, or possibly requires further attention, such as the cutting of a slot, etc. Where a milling attachment, with the necessary drive, is available, the work is easily carried out without removing the part from the chuck, but when it is necessary to re-set the item to be machined in the shaping machine vice or clamp to the machine table, possibility of error in alignment creeps in, apart from the wastage of time involved.

To overcome this trouble, the special bracket shown in the photograph was made to clamp to the vertical face of the shaping machine and to hold either the four-jaw independent or the three-jaw self-centring chucks as desired. For the bracket, a short length of steel girder was obtained, and after squaring up the ends, was secured to an angle-plate on the face-plate, and one outside face trued up. The bracket was then reversed and the other outside face machined, and, at the same time, the hole to receive the bosses of the chucks was bored out. The chuck back-plate bosses had previously both been turned to exactly the same outside diameter.



The chuck holder in use.

To hold the chucks securely in the bracket, this is split from the bore and a hole drilled through the web to take a long bolt to contract the bracket on to the chuck boss. In addition, a special clamping screw, threaded the same as the lathe mandrel, was made, and also a strong clamping plate. These parts are clearly shown in the photograph of the separate pieces, the clamp and screw being fitted from the underneath, holding the chuck firmly to the bracket. The screw is drilled throughout, the same size as the hollow lathe mandrel and has four holes in the head to take a tommy bar, although the head could, if desired, be square or hexagonal to take a spanner.

Parts of the chuck holder.

To assist in machining operations, the rims of both chuck back-plates have been carefully divided, a clear line being scribed every 6 deg.; also, a line scribed on the upper face of the bracket, so that it is a simple matter, after slacking off the clamping bolt, and the bolt passing through the bracket, to rotate the chuck any desired amount, such as for shaping a square, hexagon, etc.

The bracket is secured to the shaper by two Tee-headed bolts, and has a long key let in the back face, which engages with the keyway in the machine, exactly as on the table which has to be removed when the device is in use.

Improving Lathe Design

(*Continued from previous page*)

reason to believe that manufacturers have strained every effort to give us the right tool at the right price, and the results have been by no means so devoid of merit as might be supposed, from the criticisms of these lathes. If I am asked what is the most desirable improvement in small lathes, I vote for increasing its adaptability and scope of application. This I regard as more important than capacity, or even than super-accuracy; the latter is, in my honest opinion, less important than it sounds, because it is one thing to achieve it in the construction of the lathe, and quite another to maintain it under working conditions. All of us have encountered tragic examples of what happens to precision tools in inexpert or careless hands, and this is something no lathe manufacturer can cope with. Most of the successful model engineer's lathes have appealed chiefly by reason of their adaptability, and the slogan, "A Machine Shop in Miniature," sums up very concisely what most model engineers are really asking for, whether they know it or not.

In submitting this long and somewhat rambling statement of my personal opinions on the design of model engineering lathes, I would again emphasise that I do not expect (or even hope) that all readers will agree with me, and I trust that the Editor will not call a halt to the discussion yet, as there are many details of this subject about which open debate will be interesting and profitable.

★ Model Aeronautics

A General Purpose Duration Aeroplane

By Lawrence H. Sparey

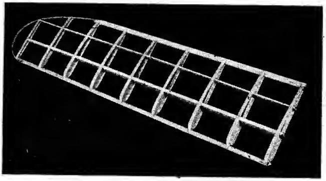


Fig. 18. Completed wing structure.

FOR reasons connected with stability the wings of this machine have been designed with a thin wing-section, and incorporate a certain amount of sweepback. Although the merits of this system are well appreciated by model flyers, sweptback wings have been somewhat neglected, chiefly, I think, because the incorporation of two angles (sweepback and dihedral) complicates the centre section of the wing. In the present case, this difficulty has been lessened by building the sweepback into the wings themselves, while the centre section looks after the dihedral angle.

Fig. 17 shows a plan drawing of the wing, together with half of the centre section. It will be noted that the ribs are set parallel to the line of flight, and, therefore, are not at a right-angle to the spars and edges. This will give us the sweepback. The building system is one which I have described before, and was again chosen because of its simplicity, and, above all, because of its economy in wood. It does, however, embody an improvement over my previous systems, in so far as the contour of the ribs is maintained at the nose by the insertion of small balsa nose formers.

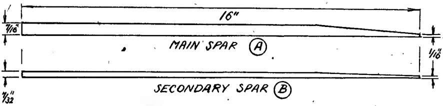


Fig. 16. Details of wing spars.

Framework

The picture, Fig. 18, shows one of the finished wing frameworks, and the first step in its manufacture will be the setting out of a full-sized drawing from the particulars given in Fig. 17. It will now be necessary to shape the main spar (*A*) from a piece of $\frac{1}{8}$-in. balsa, and the secondary spar (*B*) from 1/16-in. balsa. Also, a fair number of strips of 1/32-in. balsa, $\frac{1}{8}$ in. width, will be cut. The leading and trailing edges are both cut from 1/16-in. balsa, and are $\frac{1}{8}$ in. wide.

We may now proceed to Fig. 19, which shows the first steps. The plan drawing is pinned to a flat board, or to a cork bath-mat for preference, and the trailing edge (*C*) pinned into position. Next, nine of the $\frac{1}{8}$-in. balsa strips are pinned to the drawing along the lines of the ribs, seven of them being butt-glued to the trailing edge with cellulose cement. This may be seen in Fig. 19. Now, the main and secondary spars are added, being secured in an upright position with pins, with a touch of cement securing them to each rib strip. Finally, the small nose ribs are cemented in. The size and shape of these nose ribs may be taken from the drawing, Fig. 20.

Wing Framework

The completion of the wing framework is shown in Fig. 21. Wing tips of 1/16-in. square section birch, are bent to shape in the steam from a kettle, and are cemented into recesses cut in the leading and trailing edges, as may be seen from the illustrations. It will be found advantageous to bind two lengths of the birch together with cotton, and to bend them to shape in one operation. This will ensure that both wing tips are of identical shape.

The leading edge will now be cemented into place, and it will be noted that the balsa nose ribs are cut with slots for its reception. The top rib strips may now be added, being cemented along the tops of the nose ribs, and to the main and secondary spars, and thus to the trailing edge. It will be necessary, however, to trim the nose formers at the tip of the wing to the thickness of the main spar, before cementing on the top strips.

The rib strips are now trimmed with a razor-blade, and sanded down to blend into the leading and trailing edges, when we should have a wing structure similar to that shown in Fig. 18. This shows the left-hand wing (looking from the front of the machine) while the drawing (Fig. 17) shows the right-hand wing. It will be noted that the wings are, there-

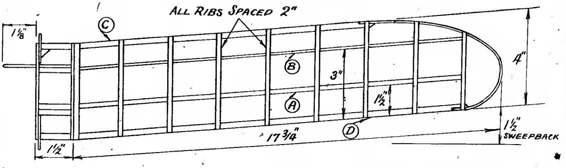


Fig. 17.

* *Continued from page 259, "M.E.," September 25, 1941.*

Fig. 19. The first step.

fore, left- and right-handed, and this requires that the drawing be reversed. The simplest system for doing this is to make the drawing for the right-hand wing upon a sheet of tracing paper. When the right-handed wing has been built and lifted from the drawing, the tracing paper may be turned completely over, the drawing traced through to the reversed side, and the building of the left wing commenced upon it.

Centre Wing Section

Turning our attention to Figs. 22 and 23, a good idea of the centre section may be obtained. Fig. 23 shows that the section is split into halves, which are joined together with a plug and socket arrangement. This is for convenience in packing and transport, but for the moment we need not bother about this, as the centre section is made as a whole, and cut into halves afterwards.

As will be more clearly seen from Fig. 24, the centre section consists of four solid balsa ribs joined together by $\frac{1}{8}$-in. balsa spars (*A*) and (*B*). The smaller drawing shows that these spars really consist of four pieces, each spar being cut into halves. Furthermore, the outer ends of the spars are cut at an angle of 5 deg. As a start, we may cut the four pieces of balsa to the shape shown; also, four solid ribs of 1/16-in. balsa, which should conform to the outline of the rib shown in Fig. 20. Now, pin pieces (*A*) and (*B*) to the building board, upon which a drawing of the centre section has been made. The outer rib is now cemented to the ends of the spars, thus standing at 5 deg. from the vertical. The two inner ribs must be *lightly* cemented together at the nose and tail, and the pair cemented to the inner, vertical ends of (*A*) and (*B*). A repetition of the process completes the other half of the section. Cement in the leading edge ($\frac{1}{4}$ in. × 1/16 in. and butt-glue the trailing edge (of similar balsa) to the ends of the ribs. Small corner blocks will be seen in Figs. 17 and 24, and the addition of these completes the centre section.

Now remains the fixing of the wings to the centre section and this is best accomplished in the manner shown in Fig. 23. Pin the centre section firmly to the building board. Flood the wing butts and the outer ribs of the centre section with cellulose cement, place together and pin securely, as shown in the picture. While the cement is setting, the wings are supported by small packing blocks (marked [X]), meanwhile checking the height of the wing tips from the building board, to ensure that both are identical. The height should be $1\frac{1}{2}$ in.

When the cement is firmly set—it is best to leave the job undisturbed overnight—the wings may be separated by cutting through the leading and trailing edges and by slipping a safety-razor blade between the two middle ribs. The necessity for *lightly* cementing these together will now be appreciated.

Plugs and Sockets

The joining sockets are made from four wraps of gummed paper tape, wound, in cigarette fashion, around a 3/16-in. dowel or knitting-needle. Plugs are of bamboo, fashioned to be a push-fit into the tubes. Cement the tubes into each half first, and let the cement harden. Now cement the plugs into position, but before the cement on these is set, plug the halves together, and again pin firmly to the building board, again leaving them, untouched, for a considerable

Fig. 20.

period. A little gentle persuasion will separate the halves when set, and we may thus be assured that the two wings will be true with each other when they are again assembled at any time.

A glance at Figs. 17 and 24 will disclose the small bamboo pegs which are cemented to the inner ribs, so that they protrude beyond the leading and trailing edges of the centre section. The photograph is self-explanatory, but it should be noted that the pegs should tilt slightly upwards. This

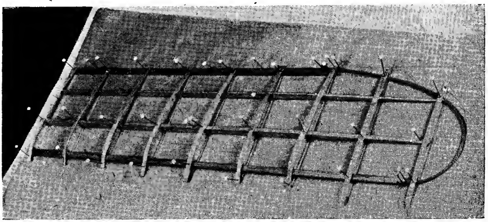


Fig. 21. Second stage in wing construction.

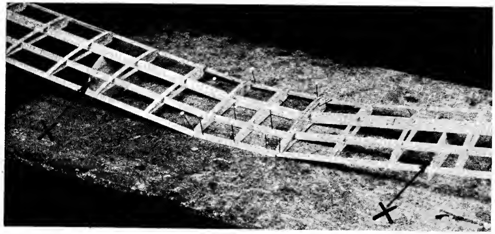


Fig. 22. Joining the wings to the centre section.

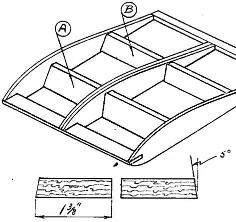


Fig. 24.

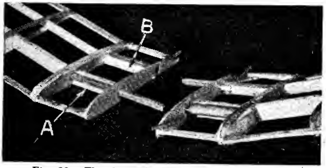


Fig. 23. The plug and socket system of wing joining.

will prevent the rubber bands, which later hold the wing to the fuselage, from slipping off the pegs.

Should balsa not be obtainable, the wings may be constructed from hardwood, in which case the following materials are suitable substitutes :—

Leading and trailing edges	3/16 in. × 1/32 in. basswood.
Main spar..	1/16 in. × 7/16 in. basswood.
Secondary spar	1/16 in. × 7/32 in. basswood.
Rib strips..	1/32 in. basswood or spruce.
Nose ribs	1/64 in. basswood.
Solid centre-section ribs	1/32 in. basswood.

(*To be continued*)

The Cleaning of Files

THE usual method of file cleaning is by using the well-known "file card," or wire brush. Such a method is not always suitable, and may sometimes be actually harmful to the file. Should the clogging particles of metal be well embedded, the only way to remove them without damage to the file is to pick them out, using a "picker" of some metal softer than the file. A piece of pointed mild steel wire will do. On no account use another file as a "picker," or both files will be damaged.

Small second-cut and smooth files (6 in.-8 in.) can be effectively cleaned by rubbing the face of the file, in the direction of the first cut, with a piece of soft metal such as copper or aluminium. By applying pressure while rubbing, the teeth of the file will bite into the "rubber," cutting tiny "pickers" which will clean out the teeth.

A wire file brush used on these small files will, through time, help to polish off and dull the cutting edges of the teeth. Remember, one way of burnishing metal is by applying it to a revolving wire brush. Imagine what happens to the file teeth with continual use of the wire brush.

Swiss files and needle files are best cleaned by rubbing with a soft metal rubber as explained, or another good cleaner is a small, stiff bristle brush such as a toothbrush. The simplest way of all is to clean the file as soon as it *starts* to clog, and use the cut of file in the correct relation to the amount of metal to be removed. An 8-in. smooth file is not the one to use to remove ⅛ in. of metal, and is bound to clog ; therefore, select a file suited to the job in hand.—INSTRUCTOR.

Letters

Steam Cars

DEAR SIR,—In reply to "Stormy Petrel," I saw Lt.-Col. David J. Smith quite recently. He is now at Dartmouth, helps in local affairs and his son in farming. His home is full of evacuees, so he has little time on his hands. His only work on steam is that he is building an early 2-2-2 steam model locomotive, using an old steam car engine in the construction.

Another early steam car pioneer, Mr. H. E. Morris, is now seriously ill. It is good to know that another early steam car champion, Dr. J. Bradbury Winter, is well and hearty. I well remember his car at Brighton which, with its copper-capped chimney, really looked a steam car. Like "L.B.S.C." it had been my ambition, at one period, to build a steam car with a loco.-type boiler, but Mr. Morriss always told me that such a generator would not stand the high pressures which were generally used on steam cars in those days.

I wonder if any readers remember the first steam bicycles. I saw one at an exhibition at the Crystal Palace. The copper boiler was in front of the steering bar, and the double-acting cylinder, I believe, worked the pedal crank. I never saw one of these under steam; perhaps our friend "L.B.S.C." may have been more fortunate, if so, his comments on the subject would be interesting.

Yours truly,

London, N. J. C. CREBBIN.

DEAR SIR,—I am not quite sure whether your correspondent "Stormy Petrel" is serious in his contentions. If he is, it seems rather absurd to draw conclusions on findings of thirty-five years ago.

I remember very clearly the articles to which he refers, and the names of Mr. David J. Smith and Mr. T. Hyler White, but these articles were simply describing how an *amateur* could construct a steam car.

Has "Stormy Petrel" never heard of Serpollet, Stanley, White and, latterly, Doble?

I contend that had the same research which has been put into I.C. engines been given to steam car work, the latter would now be far more in evidence. One has only to ride in a steam car, even of thirty years ago, to realise the astonishing difference between the two drives.

Yours faithfully,

Cobham. "SMOOTH STEAM."

DEAR SIR,—The letter of "Stormy Petrel" in the September 25 issue of THE MODEL ENGINEER has disrupted all my good resolutions; important and long overdue business letters must wait, he must be answered.

Taking his last question first. I was last in correspondence with Lt.-Col. David J. Smith less than 18 months ago. To show that Col. Smith is neither an impractical visionary nor a back number, pray note that (1) He was the man who created the organisation for the supply of spare parts and the servicing of all our mechanical transport in the last Great War, and controlled it to the end; (2) He is a past President of The Association of Automobile Engineers; (3) He was Editor in Chief of Messrs. Newnes' great work "The Complete Engineer," published in 26 parts, and completed only about 12 months ago. Col. Smith has not lost interest in steam cars; when I last heard from him he was engaged in converting an I.C. chassis to steam.

So far from being "killed" 30 years ago, steam cars were still being built in commercial quantities as late as 1936 by Mr. Abner Dobel in California, and are still being built in several plants in the U.S.A. on a more modest scale.

The troubles mentioned by "Stormy Petrel" are things of the past, spray burners with centrifugal fans have displaced atmospheric burners, the glands of the "Dobel" were free from leakage and ran a year at a time without adjustment despite a working pressure of some 1,500 lb. per sq. in., while automatic temperature control and suitable alloy steel tubes gave an entirely satisfactory boiler life.

The desire for a steam car is not difficult to understand. Give anyone with "a feeling for machinery" a short run in any old steam car in decent condition, and he will never again be quite happy behind a petrol engine. The difference has to be experienced, it cannot be described adequately. As to the feasibility of producing a steam car to better the results given by the modern petrol car, the question of what results must first be settled, and that is, in itself, beyond the scope of a letter; just consider the variety of types of petrol car in production a couple of years ago. I will, however, state my honest opinion on one relevant point; if one-tenth of the money spent in developing devices to enable the fundamentally unsuitable torque characteristics of the I.C. engine to be conveniently applied to the propulsion of road vehicles had been applied to the development of steamers, it would have been the petrol car which would have been the rarity on the road to-day.

I should dearly like to enter a discussion with "L.B.S.C." on his preference in type of power plant, but that must wait.

Yours faithfully,

Bigrigg. K. A. HELLON.

The Passing of the Steam Engine

DEAR SIR,—Your "Smoke Ring" in the "M.E." of 18th September, about steam engines, prompted me to write you this letter.

A few months ago, through reading an old "steam packing" catalogue, I discovered some very old and large steam-blowing engines at a local ironworks. Also, by good fortune the engine-house happened to be just across the way from my own place of employment. Mentioning these things to my foreman at the "works," although strictly "against the rules," he got me into the other "works," past the soldier guards, to view these engines. When I stepped through the engine-house door, what a feast for the eyes of a model engineer.

There were (it will soon be "there was") five engines, three "small" ones, vertical engines ordinary D slide-valves driven by one eccentric and rod, cylinders about 2 ft. bore by the same stroke, each engine had only one steam cylinder and one blowing cylinder. The other engine was the same type, only larger.

There was another engine-house, and in it I discovered any real model engineer's dream of delight. What an engine; it occupied two storeys of the big engine-house. The air-blowing cylinders were on the top floor, 100 in. in diameter, with the most peculiar rubber suction and delivery valves. Steam cylinders were cross-compound, h.p., about 2 ft. 6 in., l.p. about 60 in., stroke about 6 ft. Valve gear was a marvel, all gleaming rods and links. There were six eccentrics, three to each valve gear; two long rods and a shorter one drove the valves on the cylinders, which seemed to be a Corliss adaptation. A most interesting expansion gear was arranged between the high and low pressure engines independent of the main valve gear. It would seem that it "chipped" in on the main valve gear's work according to the load on the engine. These engines have a peculiarity, in that at times they must supply to the furnaces with what blast-furnacemen call "one long blow," i.e. the furnaceman shuts the air valve on the furnace so that no air gets through to the tuyeres, and then signals the blowing engineman to "blow up the main," i.e.

the whole length of main pipe from engine-house to furnace. This is done by working the blowing engine at its highest revolutions filled with a great volume of air, at more than ordinary pressure. Then it is let go in one huge " gulp " into the furnace, during a period of faulty working of a furnace. The elaborate valve-gear on the above engine must be because of the conditions of working. What a fascinating sight this huge engine must have been when working, all the links and rods gleaming and moving in harmony with the bright spokes in the 40-ton, 30-ft. flywheel. Alas, about two months ago the oxy-acetylene " burners " got busy on this fine engine to supply the insatiable " maw " of the steel furnaces with scrap. Owing to war conditions, cameras are taboo anywhere near the works, so I could not get any pictures, much to my regret.

Whenever I go to any works outside, I always look around, or ask if there are any steam engines. I have recently been moved to another works, and on the waste heat boilers at the steel plant, there are some fine little " Sisson " compound fan engines, but they are not working, and I suppose their days are numbered.

When I am going about the works attending to the instruments and see the locos. puffing about, or stand in the rolling mill engine bay and listen to the mighty chuff! chuff! of the exhaust steam into the condensers, from the l.p. cylinders of the last three large steam engines on the works, I often think of " L.B.S.C." and his locos. and all the marvellous steam engines that have been (through your good work) described in the " M.E." Although I am not old enough to remember the good old days of the large steam engine, or when power houses were full of engines with open valve-gears and bright rimmed flywheels, I have captured the atmosphere of those days by talking to any old men who worked in the engine-houses or about the works.

Maybe it would interest " M.E." readers to know that some time ago I did see a topping set of brand new " triple expansions " being lowered into a trawler, and on the wharf a set of high-pressure water-tube boilers of " pocket size " for the same boat; so maybe the days of steam engines are not finished. I wonder could any readers of the " M.E." tell of any present-day job where reciprocating steam engines have been installed instead of turbines or diesels or electric drive? There seems to be some peculiar fascination about steam engines for any engineer who really is an engineer, that other machines do not possess. The turbine's " innards " are closed up in a case, and you cannot see them go round; oil engines are enclosed; electric motors only have an armature, also enclosed. Reciprocating steam engines are fascinating to watch because of the moving parts open to view and also probably it is as young Kemp said in the " Golden Hammer," all in the valve-gear.

All good wishes to you and the " M.E." staff.

Yours truly,

Middlesbrough. JAMES BURTON.

Brass Tubes

DEAR SIR,—" L.B.S.C.'s " remarks about brass boiler tubes are interesting, as are most of his articles. Will he now tell us why brass, with all its defects, came into general use for locomotive boilers?

I suppose it would be chosen in preference to steel because of its superior heat conductivity.

In surface condensers, it is used in preference to copper, I understand, on account of the tendency of the latter to sag between tubeplates. Possibly this consideration would also hold in locomotive practice.

Yours faithfully,

Stockport. A. J. BRANDRAM, A.M.I.Mech.E.

Clubs

The Society of Model and Experimental Engineers

The next meeting of the Society will be held in The Caxton Hall, Westminster, on Saturday, 1st November, at 2 p.m., when a series of lecturettes by members has been arranged. Mr. G. E. Poulson will read a paper on " Making Calipers and Small Tools," and Mr. W. B. Hart on " The Flow of Water in Pipes." Other short contributions are invited. There will be a rummage sale in The Workshop, 20, Nassau Street, London, W.1, on Saturday, 8th November, at 2.30 p.m. Secretary, H. V. STEELE, 14, Ross Road, London, S.E.25.

Leeds Model Railway and Engineering Society

On October 5th the track meeting was supported by Mr. W. D. Hollings, of Birkenshaw, who brought along " Miss-Ten-to-Eight," recently constructed by himself. After giving a demonstration of passenger-hauling, Mr. Hollings then fixed the locomotive on to a test bench which he had brought along, and the members were shown what enormous power these locos. can produce—the coupling-rods just a blur and the floor positively shaking with the great speed produced. A credit to both maker and designer. Our next meeting will be held on October 26th, when cinema films will be shown.

H. E. STAINTHORPE (Hon. Sec.), 151, Ring Road, Farnley, Leeds.

The Kent Model Engineering Society

The following meetings have been arranged :—

October 26th : " Problem Night."

November 2nd : Open Night.

Now that meetings are held on Sunday mornings at 11, at Sportsbank Hall, the attendance is considerably better, though there is plenty of room for new members.

Several interesting track runs have recently been held.

The Junior Institution of Engineers

Future meetings of the above institution are :—

Saturday, 8th November, 1941, at 39, Victoria Street, S.W.1, at 2.30 p.m. Informal meeting. Paper, " Mills and Mill Gearing," by Rex Wailes (member).

Saturday, 15th November, 1941, at 39, Victoria Street, S.W.1, at 2.30 p.m. Annual General Meeting.

Saturday, 29th November, 1941, at 39, Victoria Street, S.W.1, at 2.30 p.m. Ordinary meeting. Paper, " The Engineer and the Rest of the World—a study in relationships," by K. S. Jewson (member).

Lord Sempill, A.F.C., F.R.Ae.S., has accepted the invitation of the Council to become President of the Junior Institution of Engineers (Incorporated) for next Session, 1941-42.

NOTICES.

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects. Matter intended for publication should be clearly written, and should invariably bear the sender's name and address.

Readers desiring to see the Editor personally can only do so by making an appointment in advance.

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